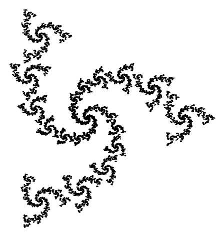
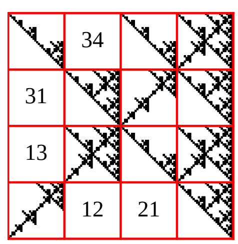
Second homework set solutions

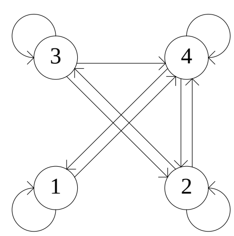
1.

r	s	θ	φ	e	f
0.75	0.75	25	25	0	0
0.25	0.25	0	0	1	0
0.25	0.25	0	0	-.5	.866
0.25	0.25	0	0	-.5	-.866

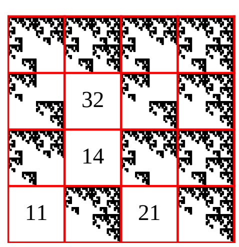


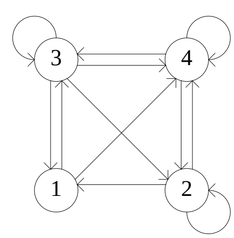
2. Inspecting the IFS with memory image, with length 2 address squares superimposed, we see the forbidden length 2 addresses are 12, 13, 21, 31, and 34. The allowed transitions are $1 \to 1$, $1 \to 4$, $2 \to 2$, $2 \to 3$, $2 \to 4$, $3 \to 2$, $3 \to 3$, $3 \to 4$, $4 \to 1$, $4 \to 2$, and $4 \to 4$. The transition graph is shown on the right.





3. The empty length 2 addresses are 11, 14, 21 and 32, so the allowed transitions are $1 \to 3$, $1 \to 4$, $2 \to 1$, $2 \to 2$, $2 \to 4$, $3 \to 1$, $3 \to 2$, $3 \to 3$, $3 \to 4$, $4 \to 2$, $4 \to 3$, and $4 \to 4$.





Consequently, states 4 is a rome. For each non-rome there is a path from a rome to the non-rome: the non-romes are 1, 2, and 3, and we have $4 \to 2$, $4 \to 3$, and although $4 \to 1$ is forbidden, we have $4 \to 2 \to 1$. These two conditions guarantee this IFS can be generated without memory.

Because there are loops between non-romes, $2 \to 2$, $3 \to 3$, $1 \to 3 \to 1$, and $2 \to 1 \to 3 \to 1$, an IFS without memory would require infinitely many transformations.